Forest Practices and the Hummingbird Creek Debris Flow

Complaint Investigation 990189

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Table of Contents

The Investigation 1

Background 1

Relevant Legislation 3

Discussion 3

On the licensee's road and culvert maintenance 3

On the government's enforcement of road maintenance requirements 5

On the approval of cutblocks after the debris flow 6

Conclusions 7

Recommendations 7

The Investigation

In July 1997 there was heavy rain in the Salmon Arm area. The cumulative precipitation over a nine-month period was the highest recorded in 100 years. During a July 11 rainfall, a large debris flow impacted properties at Swansea Point, a residential area of approximately 150 homes. The debris flow blocked Highway 97A, about 10 kilometres south of Sicamous, and flowed into Mara Lake. It directly impacted homes and structures on several properties resulting in two buildings being destroyed.

Debris and changes in groundwater also impacted residential septic fields and water wells at Swansea Point. Extensive scouring and erosion occurred along Swansea Point Road. The debris flow was the largest non-volcanic debris flow recorded in the province.

A resident of Swansea Point filed a complaint with the Forest Practices Board in 1999, asserting that a licence holder was not meeting maintenance obligations under the road permit for Skyline Road. The complainant also asserted that the Ministry of Forests did not adequately enforce these obligations. The complainant asserted that further forestry development in the Hummingbird and Mara Creek watersheds had been unfairly approved because development restrictions were placed on residents' properties due to the risk of another debris flow.

Background

The winter and spring of 1996/97 were characterized by very high precipitation, with the cumulative rain and snow over a nine-month period the highest recorded in 100 years. July 1997 saw heavy rain in the Salmon Arm area. The rainfall exceeded an 80-year period for the seven-day total and a 50-year period for the four-day total prior to July 11. During a July 11 rainfall, a landslide began, channeling debris down Hummingbird Creek into Mara Lake. The debris flow originated below the Ashton-Mara East Forest Service Road (Skyline Road) on a hillslope above Mara Lake. It impacted properties at Swansea Point and crossed the highway before entering the lake. A joint report– prepared by what was then the Ministry of Environment, Lands and Parks (MELP), the Ministry of Forests (MOF), the Ministry of Transportation and Highways and the Ministry of Attorney General– described the debris flow as significant due to its magnitude, the substantial damage to public and private property, and its impact on the fishery, water quality and loss of productive land base. The report concluded that several factors might have contributed to the initiation of the debris flow:

- concentration of discharge onto the steep slope from a culvert;
- long duration and, at times, high intensity rainfall;
- high preceding soil moisture;
- increased groundwater flow;
- thin soil that weakened when wet;
- steep slope gradient; and
- adversely dipping bedrock.

One of two culverts on the section of road was undersized, but the maximum volume of flow for the culvert was not exceeded. There was evidence that some water had been piping through the road around the culvert, but the road itself did not fail.

Riverside Forest Products was maintaining the road but was not harvesting in the area in 1997. The original road permit for Skyline Road was issued in 1988. The road was built before the Code came into effect in 1995. Because the road was built pre-Code, there is no requirement for the road to meet Code construction standards unless problems occur that require such upgrading. Section 18 of the *Forest Road Regulation* requires the person responsible for maintenance to inspect and maintain the road to ensure the integrity of the road to ensure that the drainage system is functional and to ensure that the transportation of sediment is minimized.

Enforcement staff from MELP and MOF investigated and reported separately on the licensee's actions in relation to construction and maintenance on Skyline Road. No evidence of non-compliance was identified in either report.

A report on the debris flow was also commissioned by the Shuswap Environmental Action Society. It stated that the Hummingbird Creek debris flow occurred due to the way the road was constructed and the way a cutblock above the road was logged. The slope had been weakened by high precipitation levels, the concentration of water due to the logging and the road construction. The report was critical of cutblock planning, road locations and drainage management.

MELP hired a consultant to recommend options for stream channel restoration and to assess debris flow magnitude and timing of recurrence. The consultant concluded that it was very likely that high magnitude debris flows would recur on Hummingbird Creek, and that it had been at least 75 years since a similar debris flow had occurred. This resulted in MELP placing a high-risk rating on further residential development in the area around Swansea Point.

Subsequently, in a terrain stability report completed for the licensee in 1999, the timing around recurrence was re-estimated to be at least 120 years. The preliminary results of a new study by MELP also find that this timing may be closer to 120 years. However, that has had no effect on the risk rating MELP placed on the area.

A 1991 hydrological assessment of the development plans for the licensee's operating area on the east side of Mara Lake described the area as having had extensive logging activity on the lower slopes above Mara Lake, and a history of instability. Limits on the level of harvesting were recommended. The report cautioned that further harvesting would need to be done carefully and commented on the importance of water management in the area so that natural drainage patterns are preserved.

At the time of the debris flow, three cutblocks for cutting permit (CP) 736 were proposed by the licensee in the Hummingbird/Mara Creek watershed area. The blocks had been approved in the licensee's 1995 forest development plan and 1996 silviculture prescriptions.

Following the 1997 debris flow, meetings were held with Swansea Point residents to discuss the issue. In addition, a watershed roundtable was formed with a small group of residents to get further information on the licensee's forest development plans and to look at proposed activities in detail. The main concerns of the residents since the 1997 debris flow have been with CP 736 and their efforts to get a debris basin built near their homes to contain future debris flows. Following a review of the CP 736 blocks by a terrain consultant, the cutting permit was issued in April 1998. The complaint was filed in 1999.

The Board investigated:

1. Road and culvert maintenance and compliance with the road permit and road use permit by Riverside Forest Products after June 15, 1995;

2. Government's enforcement of road maintenance requirements and the road permit and road use permit after June 15, 1995; and

3. The approval of new cutblocks in the Hummingbird and Mara Creek watersheds and the requirements for terrain and watershed assessments.

The Board investigation did not consider any issues relating to the original construction of the road because it was built before the Code came into effect and is not within the Board's jurisdiction.

Relevant Legislation

- Section 17 (now section 18) of the *Forest Road Regulation*, road inspection and maintenance
- Section 14 of the *Operational Planning Regulation*, requirement for a watershed assessment
- Section 17 of the *Operational Planning Regulation*, requirement for a terrain stability field assessment

Discussion

On the licensee's road and culvert maintenance

The complainant asserted that the licensee was not meeting its maintenance obligations under the road permit for Skyline Road. The complainant did not think there had been any activity on the part of the licensee on the road immediately prior to the debris flow. The complainant said the licensee did not indicate at initial public meetings following the debris flow that they had been on site the day of the debris flow. However some time later, the licensee said they had been. The complainant felt that if the licensee had been on site, they would have seen a problem developing.

MOF district staff commented that even if large water flows were observed prior to the debris flow, this would not indicate a problem. Culverts were reported to be running free. Immediately following the debris flow, MOF investigators noted that the culverts were not plugged. The problem was probably not the culverts; it was the amount of water being directed onto the unstable slope in combination with saturated soils.

Under the Code, the government is responsible for maintenance of forest service roads. That responsibility may be delegated to the holder of a road use permit. The licensee had a road use permit that imposed surface maintenance obligations for the first 33 kilometres of Skyline Road on the licensee. The road use permit required the licensee to preserve the running surface, maintain drainage and keep the right-of-way in an orderly fashion. That road use permit expired in July 1996 and was not reissued until July 1998. In between, there was a blanket road use permit for the licensee's operations under forest licence (FL) A18667.

Section 18 of the *Forest Road Regulation* outlines requirements to monitor and inspect a road and to act if a problem is found. Road maintenance must be carried out at intervals that take into account the risk to fish streams and the risk to users of the road. The district had rated portions of Skyline Road as a high risk for maintenance issues. Therefore, the full length of the road was treated as a high risk.

Further guidance is provided in the *Forest Road Engineering Guidebook*, which states:

For maintained or temporarily deactivated roads:

- All maintained or temporarily deactivated roads should receive one documented road inspection per year. Roads having a high or very high risk rating should also be inspected after extreme weather events. The determination of extreme weather events should be based on precipitation results for a given geographic area, relative to past events.
- Inspections after extreme weather events should be done as soon as possible after the event. Detail noted during the inspection is normally limited to major maintenance problems.
- Other inspections should be scheduled between the end of spring break-up and the beginning of fall rains.
- All inspection results should be in writing.

The recommendation for one documented inspection per year does not imply that only one inspection should be done. All staff who travel on forest roads should be encouraged to report any road maintenance problems they encounter in the course of their duties.

The licensee's inspection records for Skyline Road indicated the following inspections:

- 1995 - April 11, 13, 15, 20 and May 1, 9, 11, 16, 23, 31. Staff timesheets and contractor reports for 1995 documented 47 days of maintenance and monitoring activity between May and December (of which 22 were after the Code came into effect).
- 1996 - April 9, May 6 and June 4, 5, 6. Staff timesheets and contractor reports for 1996 documented 78 days of maintenance and monitoring activity between April and December. Following a debris flow at Rogers Creek at 11.75 km on Skyline Road in mid-April of 1996, the licensee contracted a geotechnical engineering firm to assess that debris flow. The consultant's report, dated May 24, 1996, indicates that the licensee was conducting mitigative work in the debris flow area.
- 1997 - March 31, May 1, 20, 26 and June 2. Staff timesheets and contractor reports documented maintenance and monitoring activity on the road for 30 days between April 15 and July 18.

Generally, the inspection reports and other documents identify issues of minor sloughs and cleaning of ditches and culverts. While the road inspection reports deal with maintenance, the completion of follow-up actions was usually not documented on the inspection forms. Maintenance work was documented on the staff timesheets and contractor reports.

The Board considers that the licensee did an adequate job of maintaining the road. The road was constructed pre-Code and did not fail during the heavy rain in July 1997. The long-term rainfall was record-breaking, exceeding normal maintenance conditions. There was no evidence of non-

compliance with the Code. The licensee complied with section 17 (now 18) of the *Forest Road Regulation*.

On the government's enforcement of road maintenance requirements

The district advised that they monitor roads routinely based on conditions, but not on a predetermined schedule. The frequency of monitoring is influenced by the road risk rating. Staff try to complete an aerial survey of all roads in the district twice a year.

Records of monitoring include road inspection forms and diary notes. District staff also hold informal meetings with the licensee. The licensees are not required to submit their road inspection forms to the district unless a problem occurs. When district staff travel on the road, they may fill out either a road inspection form or a timber harvesting form. Inspection forms are not filled out if there are no compliance issues. If a problem is found, the district asks to see the licensee's inspection records.

There were few documented records of inspections of Skyline Road by the district during the 1995-1997 period. MOF had no formal process to document required work in 1995 and 1996. No road inspection forms were completed and staff timesheets for those years had been discarded before the Board requested them. A 1996 consultant report on a landslide on Skyline Road at Rogers Creek confirms that district staff were on site during inspection of the slide.

Staff did not recall any enforcement action being taken against the licensee in connection with this road in 1995 or 1996, and there were no incidents documented in the district's enforcement files.

District staff commented that, because the spring of 1997 was a very wet period, road inspections were a priority. Harvesting activity under the district's small business program was taking place at the north end of Skyline Road during the previous winter and spring of 1997 and district staff were using the road at that time.

One road inspection form was completed for April 21, 1997. The inspection form records a slump across Skyline Road and the actions the licensee was taking to address it. Staff timesheets also documented that MOF staff were on the road for 10 days between March 11 and July 9, 1997.

When the Hummingbird Creek debris flow occurred, MOF staff investigated the licensee's actions and concluded that the licensee had complied with Code maintenance requirements. In October 1997, the district contracted an engineer to assess the condition of Skyline Road. The contractor used the Board's audit standards in conducting his assessment and evaluated the road as if it had been built after the Code came into effect. The contractor identified areas where the road could be modified to meet Code requirements: installing larger culverts, improving armouring of culverts, constructing catch basins at culvert intakes and removing debris build-up at culvert intakes. The contractor made recommendations to upgrade the road. District staff reported that the licensee had completed the upgrading work.

The district has now adopted a more formal and standardized enforcement and inspection program. District staff described the program as standardizing the road risk evaluation and ensuring that appropriate resources are assigned to carry out inspections. It also includes designating responsibility for each inspection, setting out objectives of the inspection and key factors to review.

The lack of documentation for past inspections indicated that a district policy was needed to formalize and standardize inspection procedures. This policy is now in place.

On the approval of cutblocks after the debris flow

The complainant asserted that further forestry development in the watersheds was unfairly approved based on an assessment of when a debris flow would occur again (return interval) that was different from what MELP used when it rated the area as a high risk. The risk rating influences the regional district's approval for development on private properties.

The MELP regional water manager commented that placing restrictions on the subdivision due to an estimated return interval does not necessarily mean forestry activities should be halted. Instead, approval of forest practices depends on the effect the forestry activity would have on increasing the risk of another debris flow. The MOF district manager said the return interval estimates had little effect on his approval of further harvesting.

The only new block approvals in the Hummingbird/Mara Creek watershed since the 1997 debris flow have been for CP 736. Two other cutting permits have been proposed in the watersheds (CP 774 and CP 767) but both are still at the information stage, proposed as category I blocks (information only) in the forest development plan. The licensee voluntarily changed one of these in 1999 from a proposed category A to category I until detailed site assessments are completed.

Under section 41 of the Act, the district manager must be satisfied that an operational plan will adequately manage and conserve forest resources before approving the plan. Prior to June 1998, operational plans under the Code included forest development plans, silviculture prescriptions and logging plans. These reflect increasingly detailed levels of planning. Terrain stability and watershed assessment issues are dealt with in the forest development plan and silviculture prescription stages. Those plans were approved prior to the debris flow, in 1995 and 1996, respectively. The logging plan was approved in 1998, but it deals with specific logging practices within the block and not the approval of the block itself. For future forest development plans proposing new blocks (including CP 774 and CP 767), the district manager will need to consider the available terrain and watershed information when determining whether the plans adequately manage and conserve forest resources.

No watershed assessments have been required or completed specifically for the Hummingbird and Mara Creek watersheds since the Code came into effect. However, a district-wide watershed assessment completed in February 1998 indicated that the amount of forest development in this area, measured as the equivalent clearcut area (ECA), was 11 percent. The licensee provided ECA estimates to the district in March 1998 indicating that the ECA in Hummingbird Creek would reach 11 percent with the development of CP 736 and that the ECA in Mara Creek would increase to about eight percent.

The most relevant information specific to CP 763 is the terrain stability assessments and maps. Reconnaissance-level terrain mapping was conducted in 1997 prior to the debris flow. The 1997 interagency report referred to earlier recommended that detailed terrain mapping be completed for Hummingbird and Mara Creek. That was completed in 1999. In addition, the district requested in 1998 that the licensee conduct an assessment of the CP 736 blocks to determine if they would drain onto unstable slopes. That was completed in April 1998.

Section 17 of the *Operational Planning Regulation* requires that a more detailed terrain stability field assessment be completed for areas that have been identified as being unstable or potentially unstable. Neither the 1997 terrain mapping nor 1999 detailed terrain mapping indicate that any of the proposed cutblocks for CPs 736, 774 or 767 are located on unstable or potentially unstable terrain. Therefore, no terrain stability field assessment is required. The key issue relating to the complainant's concern is where cutblocks may drain onto potentially unstable slopes, similar to what contributed to the 1997 debris flow. The mapping indicates that three blocks may be located above potentially unstable terrain. These are CP 736-1, CP 774-1, and CP 774-2. Only CP 736-1 has been approved. It appears that only a small portion of each of these blocks may drain onto the potentially unstable terrain.

District staff focused their reviews of CP 736 on identifying situations where there is the possibility for drainage from a block to be concentrated onto a potentially unstable slope. The licensee's April 1998 assessment included a review of aerial photos and maps to determine the drainage pattern of the blocks and the catchment area for sensitive sites below the blocks. The consultant who conducted the assessment concluded that there is a low likelihood of a debris flow being initiated, both on-site and off-site.

The Board accepts the consultant's opinion that there is a low risk associated with CP 736, but notes that this opinion was offered with qualifications; for example, that the blocks would be winter logged to avoid rutting, and that no bladed trails would be created. The logging plan contains these conditions. In finding the risk low, the consultant also assumed that all road drainage structures would be properly located, installed, maintained and deactivated.

Conclusions

1. The licensee's road and culvert maintenance after June 15, 1995, complied with the Code.

2. Government enforcement of the licensee's road maintenance obligations was appropriate, despite a lack of documentation.

3. There have been no cutblocks approved in operational plans in the Hummingbird and Mara Creek watersheds since the debris flow. The blocks for CP 736 were approved prior to the event. Regardless, Code requirements for watershed and terrain stability assessments were met and the district manager requested further analysis after the debris flow occurred.

Recommendations

The Board supports recommendations to revise the Code made in the 1997 interagency report on the Hummingbird Creek debris flow. The Board recognizes that aspects of these recommendations may have already been addressed. The recommendations were:

- Within requirements for terrain assessment, include an assessment for potential risk of loss of life, personal injury and property damage within a watershed, and make this an integral part of forestry planning; and

- Strengthen the intent of the Code with respect to the concentration of runoff from forestry operations onto unstable or potentially unstable slopes.

Section 6 of the *Forest Road Regulation* was revised in 2000 to require a professional opinion about the likelihood and consequences of a landslide in the road layout and design for areas identified as having a moderate or high likelihood of landslides. Section 13 of that regulation requires a drainage system that prevents water from being directed onto potentially unstable slopes or soil material.

There is also guidance on how to deal with runoff onto potentially unstable slopes in the *Community Watershed Guidebook*. Revisions to the *Forest Road Engineering Guidebook* are being proposed to include a risk-based approach that avoids putting downslope values at risk. Also, the *Mapping and Assessing Terrain Stability Guidebook* is being revised to clarify that the scope of a terrain stability field assessment includes any area that might be affected by a road or cutblock and not just the road prism and block area.

In addition to that information, MOF has a new training module on road development above potentially unstable slopes.

Taken together, the Board considers that the 1997 recommendations, augmented by recent and proposed changes to the law and policy, are adequate to deal with concerns such as those raised by the complainant about road development and maintenance above potentially unstable slopes.